ENGINEERING REPORT

for

CONTRACT DACW 33-83-D-0006
WORK ORDER NUMBER 5

SUBSURFACE INVESTIGATION

PROPOSED POWERHOUSE
COLEBROOK DAM
COLEBROOK, CONNECTICUT

EGA

EGA
EASTERN GEOTECHNICAL ASSOCIATES • BRIGGS
164 Washington Street, Norwell, MA 02061 ▶ Telephone (617) 773-1744

January 5, 1984

Mr. Joe B. Fryar
Chief Engineering Division
New England Division
U.S. ARMY CORPS OF ENGINEERS
424 Trapelo Road
Waltham, MA 02254

RE: Contract DACW 33-83-C-0006
Work Order No. 0005

Dear Mr. Fryar:

In accordance with Work Order No. 0005 dated 11 October 1983, we enclose one (1) copy of our Engineering Report for the Proposed Powerhouse for Colebrook Dam, Colebrook Connecticut. Three (3) additional copies have been delivered under separate cover to your Geotechnical Branch. If you have any questions or comments, please do not hesitate to call.

Very truly yours,

David S. Campbell, P.E.
President

DSC/ja
Enclosure
cc: Jim Blair

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1.0 GENERAL

1.1 Authorization

The subsurface exploration work for the proposed Colebrook Dam Powerhouse, Colebrook, Connecticut. The work was performed under Contract DACW 33-83-D-0006, Work Order No. 0005, dated 11 October 1983. The contracting officer is Edward D. Hammond, Major, CE.

1.2 Project Site

The site is located at the Colebrook Dam, Colebrook Connecticut.

1.3 Purpose and Scope of Investigation

The purpose of the investigation is to determine the foundation conditions for excavation at the site of the proposed Colebrook Dam Powerhouse.

The scope of the investigation consisted of drilling an NX size rock core to a depth of 80 feet. In addition, the hole was pressure tested from 10 ft below the rock surface to the bottom of the hole. The inspection and exploration instructions are attached as Appendix A.

2.0 QUALITY CONTROL

2.1 Equipment

The following equipment and tools were used to perform the work.

a. Core Drill: The core drill used was a modern hydraulically driven rotary head unit manufactured by Acker Drill Company.

b. Rods: NW drill rods were used during the drilling operations.

c. Core Barrel: The core barrels used to drill the rock were Acker and Christensen double tube swivel type NXM barrels. The barrels were equipment with impregnated diamond bits and surface set diamond reaming shells.

d. Pressure Testing Equipment The pressure testing equipment consisted of an NX sized pressure testing unit with expansion joints spaced 5 feet apart; a nitrogen tank and regulator for inflating the expansion units; a guage for measuring hydraulic pressure up to 200 psi and graduated in 5 psi increments; a water meter to measure volume to the nearest 0.1 ft3 and a pump capable of pumping 50 gpm at 50 psi.

e. Floating Plant: The floating plant consisted of a float with a working area of approximately 180 square feet.

2.2 Records

NED Forms 121, 58, 58A and 50 were used to record pertinent drilling and sampling operations. The boring logs included the following information:

(1) Hole number, hole designation and elevation of top of hole.

(2) Make and manufacturer's model designation of equipment.

(3) Type of drilling and sampling operation by depth.

(4) Dates and time by depth when drilling operations were performed.

(5) Depths at which cores were recovered or attempts made to core including top and bottom depth of each run. Length of recovery and Rock Quality Designation (RQD). Classification or description including geologic and common usage designation. This classification or description was made immediately following the taking of the cores.

(7) Depths at which drill water is lost and regained.

(8) Depth to bottom of hole.

The hydraulic pressure testing logs included the following information:

(1) Site Identification.

(2) Exploration Number

(3) Elevation of the top of the hole.

(4) Depth and elevation of the top of rock.

(5) Tested by.

(6) Date Tested.

(7) Zone Tested.

(8) Elapsed time in minutes and seconds of pressure drop in pounds per square inch (pressure drop test).

(9) Constant pressure flow test showing pounds per square inch, length of time test was run, meter reading before and after testing and volume of flow in gallons and gallons per minute.

(10) Notes indicating problems or unusual conditions.

(11) Groundwater table elevation or depth.

2.3 Procedures

The rock coring operations were conducted in accordance with ASTM D-2113 except that the drill rig was equipped with a hydraulically actuated feed and only double tube core barrels were employed. Succesive runs, not exceeding 10 feet in length, were made until the bottom of the hole was reached. During the coring operations, difficulty was encountered in obtaining 100% recovery on several runs since the rock could not be broken at the bottom of the core barrel. However, the core was recovered in the next run. The recovery for the entire hole was 99.14%. Following each run, the core was placed in core boxes and classified. The core boxes were labeled with the job location, boring number, depth interval covered by the core and the recovery and RQD for each run. A chain of custody log was maintained documenting custody of the cores between the field and transportation and delivery to the NED laboratory in Waltham, Massachusetts.

Following completion of the rock coring the hole was hydraulically pressure tested. The pressure testing units was lowered to the bottom of the hole, the expansion joints inflated and the water pressure brought to 50 psi. The water pressure was allowed to drop and the elapsed time in minutes and seconds for each 10 psi drop in pressure was recorded. Following the falling pressure test, the constant pressure flow test was conducted. This test consisted of adding water to the zone being tested such that a pressure of 50 psi was maintained for 10 minutes. The volume of water taken to maintain this pressure was recorded. Following the constant pressure flow test, the pressure testing unit was deflated and raised 5 feet to the next zone to be tested.

3.0 QUALITY CONTROL CERTIFICATION

I hereby certify that the above-mentioned records, equipment and procedures were used to perform the subsurface exploration described herein. I also certify that the work was performed in a professional manner and meets the requirements set forth in the work order.

CERTIFIED 5 JANUARY 1984

John Crowther

Nicholas A. Lanney, P.E.

TABLE 1
SUMMARY OF ACTIVITIES

DATE	ACTIVITY
14 November	Mobilization of raft and rig.
15 November	Mobilization of raft and rig. Moved raft upstream to boring location.
16 November	Started drilling. Roger Poisson of the Corps indicated that we had set up too close to the conduit. To avoid conduit, the hole was moved.
17 November	Moved hole again. Cored 0-5.75'.
18 November	Rig breakdown. Worked only 4 hours.
21 November	No work. Inclement weather.
22 November	No work. Inclement weather.
23 November	No work. Called work for the week because of Thanksgiving Holiday.
24 November	No work. Thanksgiving.
25 November	No work.
28 November	Worked 4 hours coring rock from 5.75' to 8.50'. No work in the afternoon due to rain storm.
29 November	Cored rock from 8.5' to 19.5'.
30 November	Cored rock from 19.5' to 43.5'.
1 December	Cored rock from 43.5' to 58.75'.
2 December	Cored rock from 58.75' to 68.25'.
5 December	Finished rock coring from 68.25' to 80.5'.
6 December	Started pressure testing. Pump malfunctioned on first test. Repaired pump.
7 December	Pressure testing from 76.43' to 35.85'.
8 December	Completed pressure testing. Tested from 5.85' to 36.43'. Started demobilizing raft and rig.
9 December	Completed demobilization and departed from site.

APPENDIX A
Inspection and Exploration Instructions

ATTACHMENT NO. 1

GEB REQUISITION NO. 84-1

INSPECTION AND EXPLORATION INSTRUCTIONS

PROJECT: Site Exploration, Colebrook Dam Powerhouse

SITE: Colebrook Dam, Colebrook, Connecticut

PURPOSE: The subsurface exploration is to determine the foundation condition for excavations at the site of the proposed Colebrook Dam Powerhouse.

SCOPE OF INVESTIGATION:

1. Perform one 80-foot NX size rock core boring at the location "staked" at the site. This location is to be viewed by Mr. Lanney on a site visit planned for 6 October 1983. (A sketch of the site showing the general location of the exploration is provided as Attachment No. 2.)

2. In addition, the hole shall be pressure tested in accordance with paragraph 15, page C-18 of the specifications. The zone to be tested shall run from 10 feet below the rock surface to the bottom of the boring.

3. A geologist shall act as field inspector while performing the exploration. The inspector shall provide a telephone report to the Project Engineer after the boring is completed and before starting pressure testing.

4. All core samples shall be delivered to the Corps of Engineers Headquarters in Waltham, MA by the field inspector. Sample delivery shall be coordinated with Director, NED Materials and Water Quality Laboratory at 617-647-8367/8392.

COORDINATION

The Contractor shall coordinate the start of the work and work period with Colebrook Dam Project Manager Mr. Paul Lewis (203-379-8234) at least one week before start of work. The Contractor shall also notify the Project Engineer, Mr. Roger Poisson, (617-647-8396) five work days before start of work.

SITE CONDITIONS

The exploration for the powerhouse is located on the left downstream abutment of Colebrook Dam near the elevation of the tailwater pool surface. The slope of the site is about 1 vertical on 2.6 horizontal. The downstream water surface is controlled by Goodwin Dam.

RIGHTS OF ENTRY

The exploration site is located on Government property. Rights of entry, approvals, permits, etc. which may be required to access the site other than on Government property, shall be secured by the Contractor.

EXPLORATION NUMBER

The exploration shall be numbered FD-83-1.

APPENDIX B
Safety Reports

EASTERN GEOTECHNICAL ASSOCIATES

WEEKLY SAFETY MEETING

TO: Safety Office, NED

FROM: Field Engineer Date held 14 NOVEMBER 1983

THRU: Project Engineer Time 1000 HRS

Weekly safety meeting was held this date for the following personnel:
Contract No. DACW 33-83-D-0006, W. O. No. 5 Personnel present:
Jeff Mullen
Conducted By: N. Lanney K. McAucliffe

1. Subjects discussed (Note, delete, or add):

x Individual Protective Equipment - Ear protection, hard hats
x Prevention of Falls -
Safe Lifting Techniques -
Emergency Communications -
Fire Prevention -
Sanitation, First Aid -
x Tripping Hazards - trash, hose, nails in lumber -
Staging, Ladders, Concrete Forms -
Hand Tools -
Portable Power Tools -
Woodworking Machinery -
Equipment Maintenance (Zero defects) -
Hoisting Equipment -
x Ropes, Hooks, Chains and Slings -
Electrical Grounding, Temporary Wiring -
Lockouts for safe clearance procedures -
Electrical, pressure, moving parts -
Welding -
Excavations -
Loose Rock and Steep Slopes -
Explosives -
x Water Safety -
Other -

Prepared by: N. Lanney
Field Engineer

2. Exposure:

No exposure. Start of new work order

Signature: Nicholas A. Lanney
Project Engineer

3. Forwarded: NED, Waltham, MA

EASTERN GEOTECHNICAL ASSOCIATES

WEEKLY SAFETY MEETING

TO: Safety Office, NED

FROM: Field Engineer Date held No meeting held

THRU: Project Engineer Time_____

Weekly safety meeting was held this date for the following personnel:
Contract No. DACW 33-83-D-0006, W. O. No. 5 Personnel present:

_____

Conducted By:_____ _____

_____

_____

_____

_____

1. Subjects discussed (Note, delete, or add):

Individual Protective Equipment - Ear protection, hard hats
Prevention of Falls -
Safe Lifting Techniques -
Emergency Communications -
Fire Prevention -
Sanitation, First Aid -
Tripping Hazards - trash, hose, nails in lumber -
Staging, Ladders, Concrete Forms -
Hand Tools -
Portable Power Tools -
Woodworking Machinery -
Equipment Maintenance (Zero defects) -
Hoisting Equipment -
Ropes, Hooks, Chains and Slings -
Electrical Grounding, Temporary Wiring -
Lockouts for safe clearance procedures -
Electrical, pressure, moving parts -
Welding -
Excavations -
Loose Rock and Steep Slopes -
Explosives -
Water Safety -
Other -

Prepared by: N.Lanney
Field Engineer

2. Exposure:

For the period from 14 November to 18 November, covering 114 manhours.
No work for the week of 21 November due to inclement weather and the Thanksgiving holiday.

Signature: Nicholas A. Lanney
Project Engineer

3. Forwarded: NED, Waltham, MA

EASTERN GEOTECHNICAL ASSOCIATES

WEEKLY SAFETY MEETING

TO: Safety Office, NED

FROM: Field Engineer — Date held 28 NOVEMBER 1983

THRU: Project Engineer — Time 1030 hrs

Weekly safety meeting was held this date for the following personnel:
Contract No. DACW 33-83-D-0006, W. O. No. 5

Personnel present:
C. Reil
P. Sullivan

Conducted By: J. Crowther

1. Subjects discussed (Note, delete, or add):

x Individual Protective Equipment - Ear protection, hard hats
x Prevention of Falls -
x Safe Lifting Techniques -
Emergency Communications -
Fire Prevention -
Sanitation, First Aid -
x Tripping Hazards - trash, hose, nails in lumber -
Staging, Ladders, Concrete Forms -
Hand Tools -
Portable Power Tools -
Woodworking Machinery -
x Equipment Maintenance (Zero defects) -
x Hoisting Equipment -
x Ropes, Hooks, Chains and Slings -
Electrical Grounding, Temporary Wiring -
Lockouts for safe clearance procedures -
Electrical, pressure, moving parts -
Welding -
Excavations -
Loose Rock and Steep Slopes -
Explosives -
x Water Safety -
Other -

Prepared by: J. Crowther
Field Engineer

2. Exposure:

No exposure. No work conducted the previous week due to inclement weather and the Thanksgiving holiday.

Signature: Nicholas A. Lowry
Project Engineer

3. Forwarded: NED, Waltham, MA

EASTERN GEOTECHNICAL ASSOCIATES

WEEKLY SAFETY MEETING

TO: Safety Office, NED

FROM: Field Engineer

Date held 5 DECEMBER 1983

THRU: Project Engineer

Time 0930 HRS

Weekly safety meeting was held this date for the following personnel:
Contract No. DACW 33-83-D-0006, W. O. No. 5

Personnel present:
C. Reil
P. Sullivan

Conducted By: J. Crowther

1. Subjects discussed (Note, delete, or add):

x Individual Protective Equipment - Ear protection, hard hats
Prevention of Falls -
Safe Lifting Techniques -
Emergency Communications -
Fire Prevention -
x Sanitation, First Aid -
x Tripping Hazards - trash, hose, nails in lumber -
Staging, Ladders, Concrete Forms -
Hand Tools -
Portable Power Tools -
Woodworking Machinery -
Equipment Maintenance (Zero defects) -
x Hoisting Equipment -
x Ropes, Hooks, Chains and Slings -
Electrical Grounding, Temporary Wiring -
Lockouts for safe clearance procedures -
Electrical, pressure, moving parts -
Welding -
Excavations -
Loose Rock and Steep Slopes -
Explosives -
x Water Safety -
Other -

Prepared by: J. Crowther
Field Engineer

2. Exposure:

For the period from 28 November to 2 December 1983, covering 3 men for 120 manhours.

Signature: Nicholas A. Lowney
Project Engineer

3. Forwarded: NED, Waltham, MA

EASTERN GEOTECHNICAL ASSOCIATES

WEEKLY SAFETY MEETING

TO: Safety Office, NED

FROM: Field Engineer Date held No meeting held

THRU: Project Engineer Time_____

Weekly safety meeting was held this date for the following personnel:
Contract No. DACW 33-83-D-0006, W. O. No. 5 Personnel present:

Conducted By:_____

1. Subjects discussed (Note, delete, or add):

Individual Protective Equipment - Ear protection, hard hats
Prevention of Falls -
Safe Lifting Techniques -
Emergency Communications -
Fire Prevention -
Sanitation, First Aid -
Tripping Hazards - trash, hose, nails in lumber -
Staging, Ladders, Concrete Forms -
Hand Tools -
Portable Power Tools -
Woodworking Machinery -
Equipment Maintenance (Zero defects) -
Hoisting Equipment -
Ropes, Hooks, Chains and Slings -
Electrical Grounding, Temporary Wiring -
Lockouts for safe clearance procedures -
Electrical, pressure, moving parts -
Welding -
Excavations -
Loose Rock and Steep Slopes -
Explosives -
Water Safety -
Other -

Prepared by: N.Lanney
Field Engineer

2. Exposure:

No meeting held. Project completed on December 9, 1983. Exposure for the period from 5 December to 9 December 1983, 124 manhours.

Signature: Nicholas A. Lanney
Project Engineer

3. Forwarded: NED, Waltham, MA

APPENDIX C
Chain of Custody Log

EASTERN GEOTECHNICAL ASSOCIATES

Chain of Custody Log

Project: Subsurface Investigation; Colebrook Dam
Colebrook, CT

ITEMS: Tubes-none

Bottles-none

Jar Samples-none

Core Boxes-8

Sampling Logs-FD-83-1

Date & Time Received	Date & Time Transferred	Comments	Custodian
as sampled	12-5-83 1500 hrs		
12-14-83 0830 hrs.	12-14-83 1130 hr		
12-14-83 1130			

APPENDIX D
Boring and Pressure Testing Logs

CORPS OF ENGINEERS, U. S. ARMY
NEW ENGLAND DIVISION
FOUNDATION AND MATERIALS BRANCH

FIELD LOG OF TEST BORING

PROJECT NO. 14548 CONT DACW 33-83-D-0006, WOS

Site Colebrook Dam — Page 1 of 14 Pages

Hole No. FDB3-1 Diam. (Casing) 3" — Boring Started 11-17-83

Co-ordinates: N _____ E _____ — Boring Completed 12-5-83

Drilled by Briggs Associates — Report Submitted _____

Purpose of Exploration Determine subsurface conditions for the proposed powerhouse

Elevation Top of Hole 638 M.S.L.
Total Overburden Drilled 0 Feet
Elevation Top of Rock 638 M.S.L.
Elevation Bottom of Hole 557.5 M.S.L.
Total Rock Drilled 80.5 Feet
Total Depth of Hole 80.5 Feet
Core Recovered 97.75 * %
Core Recovered 78.69 Ft.: NX Dia. 2.1 In.
Soil Samples NA In. Dia. ____ No.
Soil Samples _____ In. Dia. ____ No.

Casing Left in Place 0 Feet

* Recovery = 99.17% of the 0.75ft not obtained from 0 to 0.75' because a casing shoe bit was used to seat the casing and the core from 80 to 80.5 which was not recoverable are included in the total footage recovered

Water Table Depth NA

Depth From	Depth To	Method of Drilling and Type of Bit Used
0	.75	Diamond Casing Shoe
.75	80.5	Impregnated Diamond Bit

INDEX

Ground Water N/A	Back of Page ____
Boring Location Sketch ____	Back of Page 2
Overburden Record N/A	Page ____
Rock Drilling ____	Page 3-14
____	Page ____
____	Page ____
____	Page ____

Prepared by J. Crowther — Field Data — Lab. Data

Submitted by J. Crowther

NED FORM DEC 63 121 REPLACES EDITION OF JUN 51 WHICH MAY BE USED UNTIL EXHAUSTED

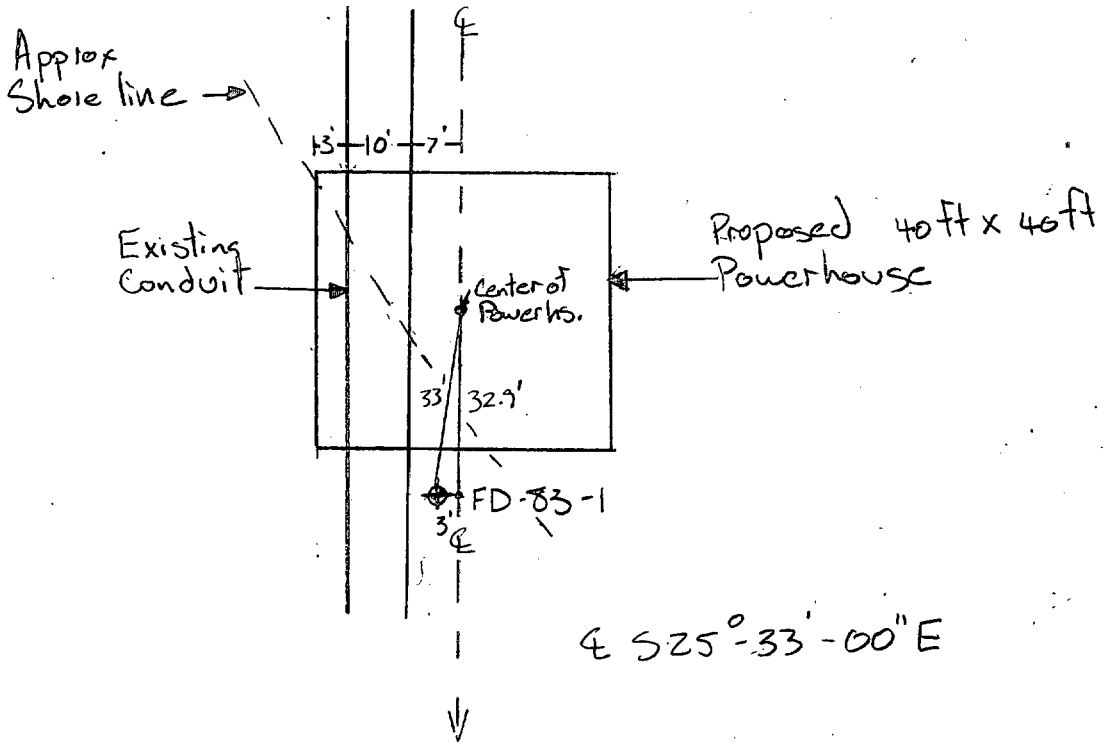
Site: Colebrook Dam Colebrook, Conn.
Boring No: FD-83-1

SUBSURFACE WATER OBSERVATIONS

DATE	TIME	DEPTH-BOT. OF CASING	DEPTH-BOT. OF BORING	DEPTH TO WATER	ELEVATION WATER	REMARKS
11-16 to					640	No ground water,
12-5						Boring was within
						the reservoir

Note: Depths are in feet below original ground

BORING LOCATION SKETCH



FIELD LOG OF TEST BORING IN ROCK

SITE Colebrook Dam Colebrook, Conn ROLE NO. FD-83-1 PAGE 3 of 14

	DATE	DEPTH PT. FROM	DEPTH PT. TO	RUN PT.	RUN REC'V'Y PT.	REC'V'Y %	DRILLING BEHAVIOR: SPEED	DRILLING BEHAVIOR: WATER	DRILLING BEHAVIOR: REASON FOR PULL	ACTUAL DRILLING TIME	BIT NO. SIZE AND TYPE	ADDITIONAL REMARKS
1	11-17-83	0.75	3.25	2.5'	2.37	94.8	CONTINUOUS	LOST FROM START	SLOW DRILLING	32 min	2.155 ID NX	Rig Adjustments were made to speed drilling when slow
2	11-17-83	3.25	4.65	1.4	1.4	100			SLOW DRILLING	46 min		
3	11-17-83	4.65	5.75	1.1	1.1	100		REGAINED At 69.0' ±	SLOW DRILLING	46 min		
4	11-28-83	5.75	6.67	0.92	0.92	100						
5	11-28-83	6.67	8.5	1.83	1.83	100			SLOW DRILLING	50 min		
6	11-29-83	8.5	10.5	2.0	2.0	100			SLOW DRILLING	101 min		Also changed bits when worn out
7	11-29-83	10.5	14.5	4.0	4.0	100			Jammed Barrel	40 min		
8	11-29-83	14.5	19.5	5.0	4.94	98.8			Full Barrel	62 min		
9	11-29-83 + 11-30-83	19.5	28.5	9.0	9.0	100				64 min		
10	11-30-83	28.5	37.5	9.0	8.69	96.6			Full Barrel	70 min		
11	11-30-83	37.5	43.5	6.0	5.92	99.2			DRILLING SLOWED	108 min		
12	11-30-83 12-1-83	43.5	52.75	9.25	9.25	100			DRILLING SLOWED	57 min		
13	12-1-83	52.75	58.75	6.0	5.89	98.2			DRILLING SLOWED	158 min		
									DRILLING SLOWED	144 min		

TOTAL BED ROCK DRILLED 80.5 FEET

TOTAL BED ROCK RECOVERED 78.69 FEET

BED ROCK RECOVERY 99.7 % PERCENT

DRILLER Charlie Reil

INSPECTOR J. Crowther

NED FORM DEC 63 130

PREVIOUS EDITION OF AEC 60 WHICH MAY BE USED UNTIL EXHAUSTED

FIELD LOG OF TEST BORING IN ROCK

SITE Colebrook Dam Colebrook Conn. HOLE NO. FD-83-1 PAGE 4 OF 14

	DATE	DEPTH PT. FROM	DEPTH PT. TO	RUN PT.	RUN REC'V'Y PT.	REC'V'Y %	DRILLING BEHAVIOR: FEED	DRILLING BEHAVIOR: WATER	DRILLING BEHAVIOR: REASON FOR PULL	ACTUAL DRILLING TIME	BIT NO. SIZE AND TYPE	ADDITIONAL REMARKS
14	12-1-83 + 12-2-83	58.75	66.75	8.0	8.0	100	CONTINUOS	NONE TILL 69.0' ±	DRILLING SLOWED	188 min	2.155 ID NX	
15	12-2-83	66.75	68.25	1.5	1.5	100			DRILLING SLOWED	58 min		
16	12-5-83	68.75	71.5	9.25	9.19	99.4			DRILLING SLOWED	52 min		
17	12-5-83	71.5	80.5	3.0	2.6/2.6 0.4 left in bottom	100			END OF BORING	31 min		

TOTAL BED ROCK DRILLED 80.5 FEET

TOTAL BED ROCK RECOVERED 78.69 FEET

BED ROCK RECOVERY 97.7 PERCENT

DRILLER Charlie Rail

INSPECTOR J. Crowther

NED FORM DEC 63 130

REPLACES EDITION OF APR 59 WHICH MAY BE USED UNTIL EXHAUSTED

U. S. ARMY
CORPS OF ENGINEERS
NEW ENGLAND DIVISION

FIELD LOG OF TEST BORING

Site Colebrook Dam, Colebrook, Conn Page 5 of 14 Pages

Boring No. 1 Desig. ED-83-1 Diam. (Casing) 3"

Co-ordinates: N _____ E _____

Elevation Top of Boring 638.0 M.S.L.
Total Overburden Drilled 0.0 Feet
Elevation Top of Rock 638.0 M.S.L.
Total Rock Drilled 80.5 Feet
Elevation Bottom of Boring 557.5 M.S.L.
Total Depth of Boring 80.5 Feet
Core Recovered 97.71% No. Boxes 8
Core Recovered 78.69 Ft. ____ Diam. 2.155 In.
Soil Samples — In. Diam. ____ No.
Soil Samples — In. Diam. ____ No.

Hammer Wt. — Boring Started 11-17-83
Hammer Drop —
Casing Left —
Boring Completed 12-5-83
Subsurface Water Data — Page ____
Obs. Well —
Drilled By Charlie Reil
Mfg. Des. Drill Acker
Inspected By: J. Crowther
Classification By: J. Crowther
Classification By: ____

DEPTH 1"=10ft	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
		3"			Cored starter hole w/ 3" casing bit to seat casing	BIOTITE GNEISS. coarse to medium grained, dark grey, some quartz-feldspar-mica veins, foliation, variable, hard.
			0.75		0.75ft.	
1.0	1				0.75ft. Elev. 637.25 11-17-83 RUN 1	
					Ft Drilled / Rec. / RQD / Time: 0.75-3.25' / 2.05 / 89.6 / 32 min = 2.5' + .32 from Run 2 = 2.37 (94.8%)	Seam @ 1.25' Seam @ 1.40'
2.0		NX		94.8%	Cored w/ 5.0 ft. Nx core barrel, at 2.5 ft. drilling slowed, pulled barrel to check for jamming. H_2O loss through bottom of casing from start.	
3.0			3.25		3.25ft. 11-17-83 RUN 2	
	2				Ft. Drilled / Rec / RQD / Time: 3.25-4.65 / 1.4ft. / 97.9 / 46 min = 1.4ft. (100%)	Seam @ 3.63'
4.0		NX		100%	Cored w/ 5 ft. Nx core barrel	
			4.65		4.65 ft. Drilling slow	
5.0	3				4.65ft. 11-17-83 RUN 3	

GENERAL REMARKS: Reservoir Elev. 641.0 ft., H_2O 30' ft deep, Top of Rock @ Elev. 638.0'

Outcrops on shore Strikes N75E to N85E and Dips North East 75°-85°

Site: Colebrook Dam, Colebrook Conn.

Boring No. FD-83-1

DEPTH	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
1"=10ft					RUN 3-cont.	
	3	NX		100%	Ft. Drilled: 4.65-5.75 = 1.1' ; Rec. 1.78 ; RQD 100 ; Time 46 min. ; -.32 to Run 2+1 ; +.14 from Run 4 = 1.00 (100%) ; Cored w/5ft. Nx core barrel -slow	
			5.75		5.75ft.	
6.0					5.75ft. 11-28-83	
	4	NX			Run 4	
					Ft Drilled: 5.75-6.67 = 0.92' ; Rec 0.96 ; RQD 100 ; Time 50min ; -0.04 to Run 3 = 0.92 (100%) ; Cored w/ 5Ft Nx core barrel -slow	seam @ 6.15'
					6.67ft.	
7.0					6.67ft. 11-28-83	
					RUN 5	
	5			100%	Ft. Drilled: 6.67-8.5 = 1.83 ; Rec. 1.93 ; -.10 to Run 4 = 1.83 (100%) ; RQD 100 ; Time 101 min.	seam @ 7.05'
					Cored w/ 5ft. Nx core barrel.	
8.0					Slow Drilling - final rig adjustment and stabilization into 11-29	
			8.5		8.5ft.	
					8.5ft Run 6 11-29-83	
9.0		NX			Ft. Drilled: 8.5'-10.5' = 2.0' ; Rec 0.88' ; +1.12' from RUN 7 = 2.0 (100%) ; RQD 100 ; Time 40 min.	
	6			100%	Cored w/ 5ft. Nx core barrel. Reamed out hole to 8.5 ft. w/bit & reaming shell to straighten out hole before coring. Jammed at 10.5, checked barrel.	
10.0			10.5		10.5ft.	
					10.5ft Run 7 11-29-83	
11.0		NX			Ft. Drilled: 10.5-14.5' = 4.0' ; Rec. 5.12' ; -1.12 to RUN 6 = 4.0 (100%) ; RQD 79.9 ; Time 62 min.	
				100%		
12.0	7				Cored 4ft. w/5ft. Nx core barrel	seam @ 12.29
					Drilling slowed, full barrel	seam @ 12.50
13.0						seam @ 12.63

Site Colebrook Dam
Colebrook Conn.

Boring No. 1
FD-83

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DEPTH 1"=1.0ft	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
14.0						seam @ 13.59' seam @ 13.67' seam @ 13.75'
			14.5'		14.5ft	
					14.5ft 11-29-83 Run 8 Ft.Drilled: 14.5'-19.5' = 5.0' Rec: 4.0' + 0.94 from RUN 9 = 4.94 (98.8%) RQD: 76.5 Time: 64 min Cored w/ 5.0 ft NX core barrel 5 ft. Drilled	
15.0		NX		98.8%		
16.0	8					seams @ 16.77' to 16.94'
17.0						seams @ 17.23' to 17.5'
18.0						
19.0						
			19.5		19.5ft.	
20.0		NX			19.5ft 11-29-83 & 11-30-83 Run 9 Ft.Drilled: 19.5-28.5' = 9.0' Rec.: 9.94 - 0.94 to RUN 8 = 9.0 (100%) RQD: 27.4 Time: + 70 min Cored w/ 10.0 ft. NX core barrel full barrel	seam @ 20.81'
21.0	9			100%		seams @ 21.56' to 22.54'
22.0						

(Test)

Boring No. FD-83-1

Site Colebrook Dam
Colebrook Conn.

Boring No. FD-83-1

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DEPTH 1"=1.0ft.	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
23.0					RUN 9 cont.	
						seam @ 23.68'
24.0						seam @ 24.10'
						seam @ 24.43'
25.0						seam @ 25.31'
						seam @ 25.44'
26.0						seam @ 26.12'
27.0						seam @ 26.80'
						seam @ 27.10'
						seam @ 27.37'
28.0					28.5 ft.	
					28.5 ft. 11-30-83	
					Run 10	
29.0					Ft. Drilled / Rec. / RQD / Time	
					28.5-37.5' = 9.0' / 5.02' + 3.67' - from RUN 11 = 8.69 = 96.6% / 89.4% / 108 min	
30.0					Cored w/10.0 ft NX core barrel Drilling slowed	

(Test)

Boring No. FD-83-1

Site Colebrook Dam
Colebrook Conn.

Boring No. FD-83-1

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DEPTH 1"=1.0Ft.	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
31						Seam @ 30.52
32						Seams @ 32.52' to 32.82'
33						Seam @ 32.96' to 33.27'
34						
35						
36						
37			37.5		37.5Ft.	
38	NX				37.5Ft. 11-30-83 Run 11 Ft Drilled 37.5-43.5 = 6.0' Rec 9.33' − 3.67 - to Run 10 + 0.29 - From Run 12 = 5.95 RQD 99.9% Time 37 min (99.2%)	
39	11			99.2%		

Test)

Boring No. FD-83-1

Site: Colebrook Dam, Colebrook Conn.

Boring No. FD-83-1

DEPTH (ft.)	CORE/SAMPLE NO.	CORE/SAMPLE SIZE	CORE/SAMPLE DEPTH RANGE	BLOWS PER FT. / CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
39					Cored w/10ft NX core barrel. Drilling slow	
40						
41						seams @ 41.0' to 41.63'
42						seam @ 42.04'
43			43.5		43.5'	seams @ 43.21' to 43.46'
					43.5' Run 12 11-30-83 & 12-1-83	
44	NX				Ft. Drilled / Rec. / RQD / Time: 43.5'-52.75' = 9.25' / 9.5' / 82.7 / 158 min; -0.29 to Run 11; 9.25 (100%)	
45	12			100%	Cored w/10ft. NX core barrel	seams @ 45.69' to 46.27'
46						seam @ 46.40'
47						seam @ 47.13'

Test)

Site Colebrook Dam, Colebrook Conn. | Boring No. FD-83-1 | Page 11 of 14

DEPTH (ft.)	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
48					Run 12 cont.	Seam @ 47.56' Seam @ 47.78' Seam @ 48.16' Seam @ 48.38' to 49.09'
49						Seam @ 49.42'
50						Seam @ 49.95'
51						Seam @ 51.09'
52			52.75		52.75 52.75 Run 13 12-1-83	Seam @ 52.42' Seam @ 52.76'
53	NX				Ft. Drilled / Rec. / RQD / Time 52.75'-58.75' / 5.50 / 92.6 / 144 min = 6.0 +0.39 - From Run 14+15 5.89 (98.2%)	Seam @ 53.06'
54				98.2%		
55	13				Cored w/10.0 ft. NX core barrel. At 54.75' progress slowed, replaced casing and NX bit. Rock stayed in hole. Jammed at 58.75 ft.	
56						

Site Colebrook Dam
Colebrook Conn.

Boring No. FD-83-1

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DEPTH (ft)	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
56						
57						
58						seam @ 58.02'
						seam @ 58.26'
59			58.75		58.75	
					58.75 Run 14 12-1-83 & 12-2-83	
					Ft Drilled Rec. RQD Time	
					58.75-66.75 8.35 98.4 180	seam @ 59.74 to 60.61
60	14				=8.0 +0.39 - to Run 13	
					+0.04 - from Run 15	
		NX		100%	8.0	
					100%	
61						
					Cored w/10ft. Nx core barrel progress slow pulled barrel @ 66.75'	
62						
						seam @ 62.61
63						
64						

Site Colebrook Dam
Colebrook Conn.

Boring No. FD-83-1

DEPTH ft.	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
65						
66						
			66.75		66.75	seam @ 66.75'
			66.75		12-2-83	
67					Run 15	
					Ft. Drilled / Rec / RQD / Time	seams @ 67.39' to 68.06'
					66.75-68.25' / 1.54 / 100 / 55 min	
					= 1.5' -0.04 - to Run 14	
	15	NX		100%	1.5	
68					100% Progress slowed	
			68.25		68.25 ft. cored w/10 ft. NX core barrel	seams @ 68.18' to 70.47'
			68.25 ft.		12-5-83	
					Run 16	
69					Ft. Drilled / Rec. / RQD / Time	
					68.25-77.5 / 8.0 / 81.8 / 52 min	
	16	NX		99.4%	= 9.25 + 1.19 - from Run 17	
					9.19	
70					(99.4%)	
					Cored w/10 ft. NX core barrel, H_2O gained out the top of casing. pulled to check barrel	seam @ 70.72'
71						
72						
73						

Site Colebrook Dam
Colebrook, Conn.

Boring No. FD-83-1

DEPTH 1"=1.0ft.	CORE/SAMPLE NO.	SIZE	DEPTH RANGE	BLOWS PER FT. CORE REC'VY	SAMPLING AND CORING OPERATIONS	CLASSIFICATION OF MATERIALS
73						
74						
75						
76						
						Poss. seam @ 76.35'
77						
					77.5ft.	
					77.5ft. 12-5-83 Run 17 Ft. Drilled / Rec / RQD / Time 77.5'-80.5' / 3.79 / 100 / 31 min 3.0 - 1.19 - to Run 16 -0.4 2.6 2.6 (100%) 0.4 left in bottom of hole see note Cored w/ 5ft. NX core barrel	
78						
79						
80						
			80.5		80.5'	
					End of Boring @ 80.5' Note: Boring hole stayed open to 80.1' as measured by tape at completion.	
81						

Corps of Engineers, U.S. Army — New England Division, Foundation and Materials Branch — Waltham, Massachusetts

FIELD LOG OF PRESSURE TEST FOR CORE BORING IN ROCK

Site Colebrook Dam, Colebrook, Conn Exploration No. FD-83-1 Page 1 OF 6 Tested by J. Crowther

Elev. Top of Hole 638.0 Depth Top of Rock 0.0ft Elev. Top of Rock 638.0 Date 12-7-83

	Core Rec. %	PRESSURE DROP TEST: Depth From	Depth To	Elapsed Time (min. & sec.) Pressure Drop. psi: 50	40	30	20	10	0	CONSTANT PRESSURE - FLOW TEST: Pres. psi	Time min.	Meter Reading* Start	Meter Reading* End	Volume of Flow Gal.	Volume of Flow Gal/min.
#1		70.85	76.43	0 sec.	9 sec.	28 sec.	1min34s.	3min44s	7min 9s	50	0-2m	3299.15	3299.42	2.02	1.01
											2-4m	3299.42	3299.66	1.80	0.90
											4-6m	3299.66	3299.82	1.20	0.60
											6-8m	3299.82	3300.05	1.72	0.86
											8-10m	3300.05	3300.24	1.42	0.71
										TOTAL	0-10m	3299.15	3300.24	8.15	0.82
#2		65.85	71.43	0 sec.	5 sec.	15 sec.	1min17s	3min49s	7min35s	50	0-2m	3298.25	3298.39	1.05	0.53
											2-4m	3298.39	3298.52	0.97	0.49
											4-6m	3298.52	3298.63	082	0.41
											6-8m	3298.63	3298.71	0.60	0.30
											8-10m	3298.71	3298.82	0.82	0.41
										TOTAL	0-10m	3298.25	3298.82	4.26	0.426

Additional Data and Remarks PACKERS inflated to 110-120 PSI, No leaks gas or H_2O discernable. * Meter reading in cubic feet. WATER EL = 640'

NED FORM 50

Corps of Engineers, U.S. Army — New England Division, Foundation and Materials Branch — Waltham, Massachusetts

FIELD LOG OF PRESSURE TEST FOR CORE BORING IN ROCK

Site Colebrook Dam, Colebrook, Conn Exploration No. FD-83-1 Page 2 OF 6 Tested by J. Crowther

Elev. Top of Hole 638.0 Depth Top of Rock 0.0ft Elev. Top of Rock 638.0 Date 12-7 83

	PRESSURE DROP TEST									CONSTANT PRESSURE - FLOW TEST					
Core Rec. %	Depth From	Depth To	Elapsed Time(min./sec.) 50	40	30	20	10	0 Pressure Drop, psi		Pres. psi	Time min.	Meter Reading* Start	Meter Reading* End	Volume of Flow Gal.	Volume of Flow Gal/min.
#3	60.85	66.43	0 sec.	48 PSI After 15 min.		CALLED TEST									
#4	55.85	61.43	0 sec	2 min 49s	4 min 7s	5 min 55s	8 min 48s	13 min 5s		50	0-10 m	3300.49	3300.50	0.075	0.008
#5	50.85	56.43	0 sec.	2 min 10s	5 min 22s	11 min 30s	29 min 29s	8 PSI 35 min		5.0	0-10m	3300.52	3300.52	0	0
#6	45.85	51.43	0 sec.	0 sec.	35 PSI 1 sec.	5 sec.	13 sec.	23 sec		50	0-2 m	3303.45	3306.98	26.4	13.2
											2-4 m	3306.98	3308.36	10.32	5.16
											4-6 m	3308.36	3310.63	16.98	8.49
											6-8 m	3310.63	3312.80	16.23	8.12
											8-10 m	3312.80	3314.98	16.31	8.15
										TOTAL	0-10m	3303.45	3314.98	86.24	8.624

Additional Data and Remarks * Meter readings in cubic feet

NED FORM 50

Corps of Engineers, U.S. Army — New England Division, Foundation and Materials Branch — Waltham, Massachusetts

FIELD LOG OF PRESSURE TEST FOR CORE BORING IN ROCK

Site Colebrook Dam, Colebrook, Conn Exploration No. FD-83-1 Page 3 OF 6 Tested by J. Crowther

Elev. Top of Hole 638.0 Depth Top of Rock 0.0ft Elev. Top of Rock 638.0 Date 12-8-83

	PRESSURE DROP TEST									CONSTANT PRESSURE - FLOW TEST					
	Core Rec. %	Depth From	Depth To	Elapsed Time (min./sec.) 50	40	30	20	Pressure Drop, psi 10	0	Pres. psi	Time min.	Meter Reading* Start	Meter Reading* End	Volume of Flow Gal.	Volume of Flow Gal/min.
#7		40.85	46.43	0 sec.	1 sec	2 sec	3 sec.	7 sec.	18 sec.	50	0-2 min	3318.46	3318.73	2.02	1.01
											2-4 min	3318.73	3318.99	1.94	0.97
											4-6 min	3318.99	3319.26	2.02	1.01
											6-8 min	3319.26	3319.64	2.84	1.42
											8-10 min	3319.64	3320.04	2.99	1.50
										Total	0-10 min	3318.46	3320.04	11.82	1.18
#8		35.85	41.43	0 sec	2 sec	4 sec.	6 sec	15 sec.	28 sec	50	0-2 min	3320.42	3320.71	2.17	1.09
											2-4 min	3320.71	3320.96	1.87	0.94
											4-6 min	3320.96	3321.21	1.87	0.94
											6-8 min	3321.21	3321.47	1.94	0.97
											8-10 min	3321.47	3321.72	1.87	0.94
										Total	0-10 min	3320.42	3321.72	9.72	0.972

Additional Data and Remarks * Meter readings in cubic feet

NED FORM 50

Corps of Engineers, U.S. Army — New England Division, Foundation and Materials Branch — Waltham, Massachusetts

FIELD LOG OF PRESSURE TEST FOR CORE BORING IN ROCK

Site Colebrook Dam, Colebrook, Conn Exploration No. FD-83-1 Page 4 OF 6 Tested by J. Crowther

Elev. Top of Hole 638.0 Depth Top of Rock 0.0ft Elev. Top of Rock 638.0 Date 12-8-83

	PRESSURE DROP TEST								CONSTANT PRESSURE - FLOW TEST					
Core Rec. %	Depth From	Depth To	Elapsed Time (min./sec.) Pressure Drop, psi 50	40	30	20	10	0	Pres. psi	Time min.	Meter Reading* Start	Meter Reading* End	Volume of Flow Gal.	Gal/min.
#9	30.85	36.43	0 sec	1 sec	2 sec	4 sec	7 sec	12 sec	50	0-2 min	3323.31	3323.95	4.79	2.40
										2-4 min	3323.95	3324.57	4.64	2.32
										4-6 min	3324.57	3325.18	4.56	2.28
										6-8 min	3325.18	3325.82	4.79	2.40
										8-10 min	3325.82	3326.44	4.64	2.32
									TOTAL	0-10 min	3323.31	3326.44	23.41	2.341
#10	25.85	31.43	0	—	—	—	—	1 sec	45 MAX.	0-2 min	3334.64	3338.25	27.00	13.5
										2-4 min	3338.25	3342.70	33.29	16.65
										4-6 min	3342.70	3347.04	32.46	16.23
										6-8 min	3347.04	3351.23	31.34	15.67
										8-10 min	3351.23	3355.44	31.49	15.75
										0-10 min	3334.64	3355.44	155.58	15.556

Additional Data and Remarks * Meter readings in cubic feet

NED FORM 50

Corps of Engineers, U.S. Army — New England Division, Foundation and Materials Branch — Waltham, Massachusetts

FIELD LOG OF PRESSURE TEST FOR CORE BORING IN ROCK

Site Colebrook Dam, Colebrook, Conn Exploration No. FD-83-1 Page 5 OF 6 Tested by J. Crowther

Elev. Top of Hole 638.0 Depth Top of Rock 0.0ft Elev. Top of Rock 638.0 Date 12-8-83

	Core Rec. %	PRESSURE DROP TEST: Depth From	Depth To	Elapsed Time (min./sec.) Pressure Drop, psi: 50	40	30	20	10	0	CONSTANT PRESSURE - FLOW TEST: Pres. psi	Time min.	Meter Reading* Start	Meter Reading* End	Volume of Flow Gal.	Volume of Flow Gal/min.
#11		20.85	26.43	0 sec	1min 5s	4min 16s	13min 41s	31min 9s	14PSI 35min	50	0-10min	3356.89	3356.89	0	0
#12		15.85	21.43	0s	50PSI After 15 min	CALLED	TEST								
#13		10.85	16.43	0	→				2 sec	35 MAX	0-2m	3359.11	3363.45	32.46	16.23
											2-4m	3363.45	3368.78	39.87	19.93
											4-6m	3368.78	3372.10	24.83	12.42
											6-8m	3372.10	3376.44	32.46	16.23
											8-10m	3376.44	3380.80	32.61	16.31
										TOTAL	0-10m	3359.11	3380.80	162.24	16.22

Additional Data and Remarks * Meter readings in cubic feet

NED FORM 50

Corps of Engineers, U.S. Army | New England Division, Foundation and Materials Branch | Waltham, Massachusetts

FIELD LOG OF PRESSURE TEST FOR CORE BORING IN ROCK

Site Colebrook Dam, Colebrook, Conn Exploration No. FD-83-1 Page 6 OF 6 Tested by J. Crowther

Elev. Top of Hole 638.0 Depth Top of Rock 0.0ft Elev. Top of Rock 638.0 Date 12-8-83

PRESSURE DROP TEST									CONSTANT PRESSURE - FLOW TEST					
Core Rec. %	Depth From	Depth To	Elapsed Time (min./sec.) Pressure Drop, psi: 50	40	30	20	10	0	Pres. psi	Time min.	Meter Reading* Start	Meter Reading* End	Volume of Flow Gal.	Volume of Flow Gal/min.
#14	5.85	11.43	0 sec	5 sec	13 sec	28 sec	1 min 10 s	4 min 30 s	50	0-2m	338280	338286	0.45	0.23
										2-4m	338286	338293	0.52	0.26
										4-6m	338293	338300	1.05	0.53
										6-8m	338300	338307	0.52	0.26
										8-10m	338307	338313	0.45	0.23
										0-10m	338280	338313	2.47	0.247

Additional Data and Remarks * Meter readings in cubic feet

NED FORM 50

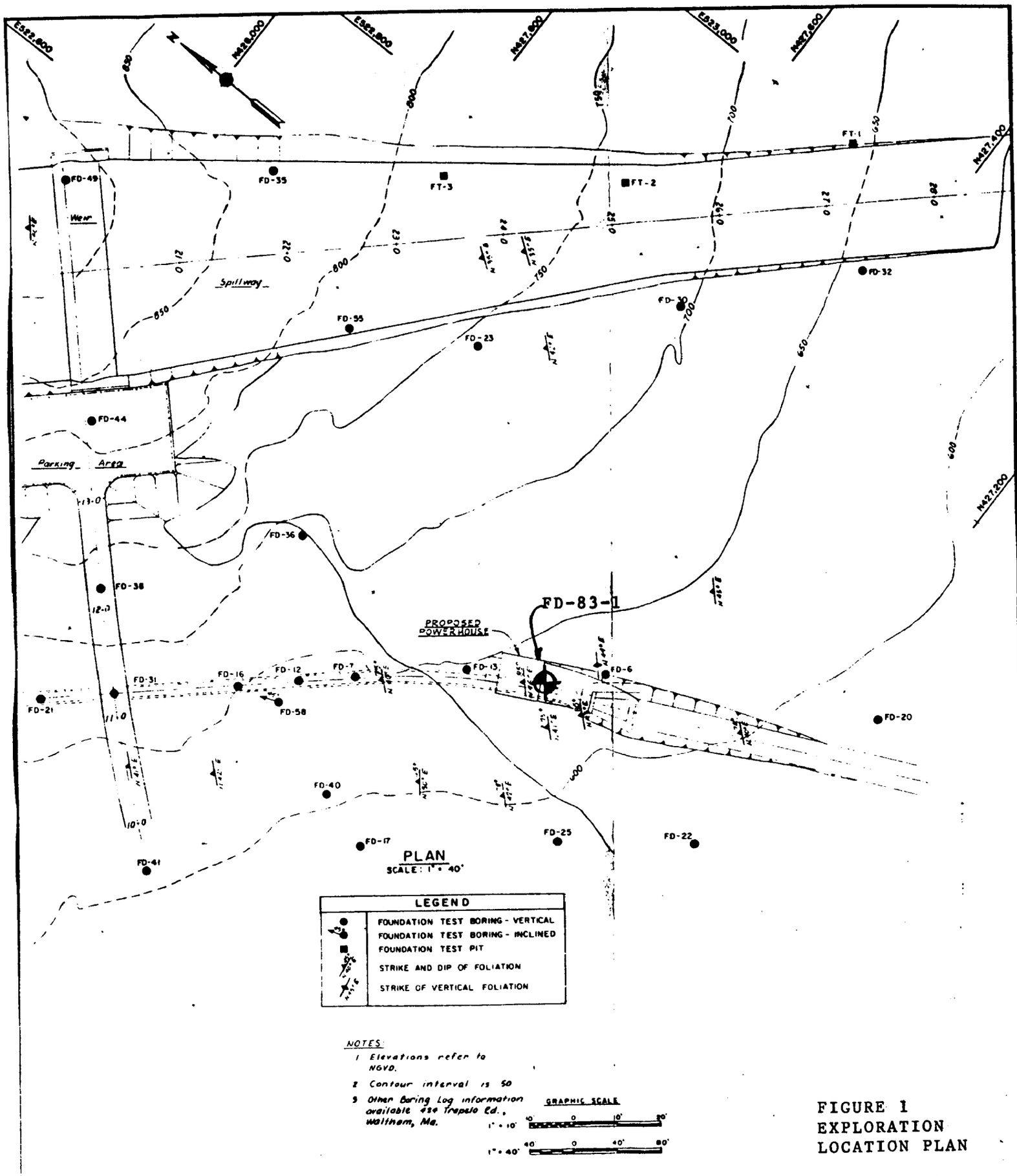

FIGURE 1
EXPLORATION
LOCATION PLAN